Remarks

Claim Rejections – 35 USC 102(b)

Claims 1, 3 and 9 are rejected as being unpatentable over Deckard.

Valid rejection under 35 USC 102 requires that each feature of a rejected claim be disclosed in a single reference. "For anticipation under 35 USC 102, the reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present." MPEP 706.02(a)

Deckard does not disclose or teach each feature of claims 1, 3 or 9.

Deckard discloses a powder leveling device including a drum and a mechanism for moving the drum from one end to the other end of the target area on which powder has been dispensed. The drum moving mechanism keeps the drum on a desired spacing above the target area with the mound of powder to get a layer of powder of the desired thickness.

To provide a controlled layer thickness of powder in the target area, the drum is actuated to counter-rotate at high speed to contact the mound of powder along the trailing edge (col. 9, lines 35, 36). This mechanical action of the drum on the powder rejects the powder to the direction of the movement M. For this desired movement of the level mechanism the drum is provided with an outer knurled surface (col. 6, line 41).

Deckard does not describe or discuss the problem of projecting or uneven sections which are larger than the thickness of the powder layer to be applied. Referring to column 9, lines 46 to 53 of Deckard, Deckard's powder leveling device will only work if the desired thickness of the mound of powder is absolutely thicker than the maximum of the uneven or the projecting sections. The invention however allows applying a layer of powder to the areas of the surface of the shaped body which lie below or adjoin a plane which is defined by the predetermined layer

thickness for the next powder layer to be processed, irrespective of projecting sections or uneven sections.

If the drum according to Deckard with its knurled surface will contact the uneven sections they will be milled away. If this knurled surface will contact the projecting sections they will be bent or milled away. This will greatly damage fine structured bodies or delicate structures. Therefore, the leveling device according to Deckard will lead to the contrary of that what the invention intends and achieves.

In summary, the leveling mechanism according to Deckard comprising a cylindrical drum which is counter-rotated with respect to the direction of the movement, and does not describe or consider the problem of the projecting or uneven sections which are larger than the thickness of the powder layer to be applied.

The invention makes it possible by using an applicator unit fixing the applied powder layer to a layer below it by applying the powder selectively to regions of a surface of the shaped body that lie below or adjoin a plane. A defined predetermined layer thickness will be provided for a next powder layer to be processed. This next powder layer has a predetermined thickness, irrespective of projecting or uneven sections, which might be larger than the thickness of the powder layer to be applied. This also enables that not only the powder is melted, but also the projecting or uneven sections above the layer are superficially melted in the predetermined areas. As a result, the projecting or uneven sections are integrated with a melted layer.

According to Applicant's claim 9, the device comprises an applicator unit with selection means for a selective application of the powder layer. As discussed above, the leveling mechanism of Deckard comprises a rotating drum, which is moved across the target area. An even surface of the mound of powder will be achieved by counter-rotating the drum with respect

to the direction of the movement across the target area. Neither a selection nor selection means are disclosed nor is a selection possible.

Given the above argument, claims 1, 3 and 9 of the present invention should be patentable over Deckard.

Claim Rejections – 35 USC 103(a)

Claims 4-8 stand rejected as being unpatentable over Deckard.

Claims 10-21 stand rejected as being unpatentable over Deckard in view of Penn.

Claims 2 and 22-23 stand rejected as being unpatentable over Deckard in view of Mazumder.

MPEP 2142 sets forth "The Legal Concept of *Prima Facie* Obviousness."

To establish a *prima facie* case of obviousness under 35 USC 103(a) the initial burden is on the Examiner to provide some suggestion of the desirability of doing what the inventor has done. "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the Examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references."

MPEP 2143 sets forth basic requirements of a *Prima Facie* case of obviousness.

"To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488. 20 USPQ2d 1438 (Fed. Cir. 1991)."

The cited references do not motivate or suggest to a skilled artisan to combine these references to produce applicant's invention as claimed.

Patent No.	Filing Date	Date of Patent	Assignee	Title
US 5,017,753	June 22, 1990	May 21, 1991	University of Texas System	Method and apparatus for producing parts by selective sintering
US 5,260,009	June 24, 1992	Sept. 11, 1993	Texas Instruments, Inc.	System, method and process for making three-dimensional objects
US 2002/0065573	July 27, 2001	May 30, 2002	Mazumder, Morgan et al.	Direct metal deposition apparatus utilizing rapid-response diode laser source

US 5,017,753 (Deckard)

Deckard discloses a powder leveling device including a drum, a mechanism for moving the drum across the region, and a mechanism for counter-rotating the drum as it is moved across the region.

The drum moving mechanism keeps the drum a desired spacing above the region to get a layer of powder of a desired thickness.

Deckard is depicted in the attached sketch of Deckard's Fig. 9.

US 5,260,009 (Penn)

Penn discloses a method and process for manufacture of three-dimensional objects and involves dispensing a layer of liquid, insoluble material onto a platform at predetermined locations, which then hardens.

A second media is then sprayed onto this layer to thereby encapsulate the hardened insoluble media. The uppermost surface of this encapsulant is planed, thus removing a portion of the encapsulant to expose the underlying insoluble material for new pattern deposition.

After the resulting planing residue is removed, another layer of liquid, insoluble media of any color is dispensed onto the planed surface.

US 2002/0065573 (Mazumder)

Mazumder discloses a system for automatically controlling the building-up of material on a substrate with a controllable semiconductor-based diode laser used in closed-loop Direct Metal Deposition (DMD) systems.

Differentiation the Invention from the State of the Art

The invention makes it possible to apply a layer of powder to the areas of the surface of the shaped body that lie below or adjoin a plane which is defined by the predetermined layer thickness of the powder layer to be applied, on a layer of the shaped body which was melted.

For the present invention it is important that, when the laser beam is directed on the surface of the powder layer, not only the powder is melted, but also the projecting or uneven sections above the layer are superficially melted in the predetermined areas. As a result, the projecting or uneven sections are integrated with the melted layer.

The invention relates to a process for producing three-dimensional parts by selective laser melting. The characteristics of selective laser melting are known from the German Patent Document DE 196 49 865 C1 or the corresponding US Patent Document US 6,215,093. For the process of selective laser melting it is characteristic that the energy of the laser beam is selected in such a way that the metallic powder is completely melted over the layer thickness at the point of incidence of the laser beam. The laser beam is guided over the predetermined area of the

powder layer in a plurality of tracks, in such a manner that each successive track of the laser beam partially overlaps the preceding track.

Penn is depicted in the attached sketch of Penn's Figs. 8a – 8c.

Claim 2

The powder is applied only to those areas that lie below and/or adjacent to the plane that is formed by the desired layer thickness. The projecting areas which lie above the desired layer thickness are missed out for the powder application.

The Examiner argues that Mazumder teaches a powder applicator unit for a laser sintering device whereby the size of a projecting section and the quantity of powder which can be discharged is limited and controllable.

For Mazumder's DMD process, it is characteristic that a laser beam is focused onto a workpiece, creating a melt pool into which a powder material is injected. A powder nozzle sprays the powder coaxial to the laser beam onto the melt pool, where the powder is completely melted. A sensor system monitors and controls the material deposition. An important characteristic of a laser sintering or a laser melting process is that the material powder is applied as a layer onto the whole part. When the powder is applied the laser beam is directed onto the powder layer to melt the powder in those areas based on the CAD model of the part that was calculated. The excessive, non-molten powder is removed when the part is completed.

Mazumder's DMD process does not deal with the problem of projecting sections. After the target area (damaged structures of a tool or part) is defined, the surface is milled down. New material can then be added.

Claims 3, 6, 8 and 9

In column 4, lines 5-17, Deckard discloses a device for distributing powder as a layer over the target region. The distributing device includes a drum, a mechanism for moving the drum across the region, and a mechanism for counter-rotating the drum across the region. The drum moving mechanism keeps the drum at a desired spacing above the region to get a layer of powder of a desired thickness. The drum is operable when counter-rotated and moved across the region to project powder forward in the direction of movement, leaving behind a layer of powder having the desired thickness. The Examiner cited the above text to argue against claims 3, 6, 8 and 9.

Deckard does not suggest moving the applicator unit and/or the leveling device more times over the surface of the shaped body to apply a layer of powder and/or to smooth and distribute the applied powder in the layer (claim 3 and claim 6).

The invention's distributing device comprises an applicator unit to apply a mound of powder over the shaped body and a leveling device to distribute and smooth the mound of powder in an even layer. Claim 8 requires that the applicator unit is coupled to the leveling device. Claim 9 requires that the applicator unit has selecting means for the selective application of the powder layer. Deckard's Figure 10 shows a distributing device (114), wherein the applicator unit is not coupled to the drum (116). In column 9, lines 5-19 it is disclosed that an amount of powder is deposited at one end of the target area, and the drum is spaced away from the end when the powder is dispensed. The drum is lowered to contact the mound of powder and brought horizontally across the target region to spread the mound of powder in a smooth even layer.

Claim 4

The Examiner notes that it would have been obvious to one skilled in the art at the time the invention was made to allow projecting sections of the last melted layer which project above the desired layer thickness of the applied powder to be uncovered by the leveling device in the invention taught by Deckard since a smooth layer of powder is to be distributed in the target area which includes both sintered and unsintered particles and the uneven sintered particles would be forced above the applied powder layer due to differences in thickness.

During the passage over the shaped body, the powder drops onto the layer that was melted last. The leveling device is guided over the surface of the shaped body at the desired thickness of the layer which is to be applied.

The drum taught by Deckard is inapplicable to smooth and distribute the powder in the areas between the projecting sections to an even layer with desired thickness of the layer. The drum moving mechanism must lift the drum or the drum is selected in such a way that the drum can smooth the surface of the projecting sections to the desired thickness of the layer. This mechanism is known from the introduction of the present patent application.

Claim 10

The leveling device comprises individual elements that pull off the powder layer down to the desired layer thickness and uncover the projecting sections of the layer.

In column 2, lines 9-14, Penn teaches that it is know to use a rolling brush to deposit and level powders in a laser sintering system. However, Penn notes that leveling fine powders with a rolling brush often causes nonhomogeneous packing density (column 2, lines 15-16).

Penn does not describe the problem of projecting sections which are larger that the desired layer thickness, or the solution to use a leveling device with individual elements.

A person skilled in the art concludes from Penn that a rolling brush is not a proper leveling device for fine powders. The object of the present invention is to build up layers of constant thickness, in particular even in the case of fine and delicate structures. To build fine structures fine powders are necessary. Therefore, a person skilled in the art would not start from the disclosure of Penn when searching for a leveling device to build up fine structures.

Claims 11-19 and 20-21

The Examiner argues that it would have been obvious to one skilled in the art at the time the invention was made to utilize the present invention's claims 11-19 and 20-21 by Deckard in combination with Penn.

Claims 11-19 of the present invention describe specific embodiments of the individual elements of the leveling device. First, in combination with the new and inventive claim 1, claims 11-19 are also new and inventive. Furthermore, Penn does not disclose the specific embodiments of the leveling device corresponding to claims 11-19 of the present invention.

The present invention's claims 20-21 describe a specific embodiment of the leveling device in form of individual elements, which are deflected by means of an articulated joint (claim 20) and a dampening element on one side close to the articulated joint (claim 21). Penn does not disclose individual elements with an articulated joint and a dampening element as a leveling device.

Claims 22 and 23

The Examiner argues that it would have been obvious to one skilled in the art at the time the invention was made to utilize the present inventions' claims 22 and 23 by Deckard in combination with Mazumder.

Claims 22 and 23 describe a scanning element for the selective application of powder. The scanning element has a closure section that interacts with an opening in the applicator unit and opens or closes the opening as a function of the size of a projecting section (claim 22) and a middle area that interacts with the opening in the applicator unit and limits the maximum quantity of powder which can be discharged (claim 23).

Mazumder does not disclose a scanning element with a closure section and a middle area corresponding to the claims 22 and 23 of the present invention. In Mazumder's DMD process, a sensor system (CCD camera) monitors and controls the material deposition.

The above discussion shows that the cited references do not motivate or suggest to a skilled artisan at the time of the invention to combine these references to produce Applicant's invention as claimed.

Wherefore, further consider and allowance of the claims is respectfully requested.

A three-month extension of time in which to respond to the outstanding Office Action is hereby requested. PTO-2038 authorizing credit card payment for the amount of $980 is enclosed for the prescribed Large Entity three-month extension fee.

Respectfully submitted,

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I hereby certify this correspondence is being submitted to Commissioner for Patents, Washington, D.C. 20231 by facsimile transmission on November 8, 2004, fax number (703) 872-9306.

M. Robert Kestenbaum

3. State of the art in the official action

Patentno.	Filing Date	Date of Patent	Assignee	Title
US 5,017,753	22.06.1990	21.05.1991	University of Texas System	Method and apparatus for producing parts by selective sintering
US 5,260,009	24.06.1992	09.11.1993	Texas Instruments Inc.	System, method, and process for making three-dimensional objects
US 2002/0065573	27.07.2001	30.5.02	Mazumder, Morgan et al.	Direct metal deposition apparatus utilizing rapid-response diode laser source

US 5,017,753 (Deckard)

- Deckard discloses a powder levelling device including a drum, a mechanism for moving the drum across the region, and a mechanism for counter-rotating the drum as it is moved across the region.
- The drum moving mechanism keeps the drum a desired spacing above the region to get a layer of powder of a desired thickness.

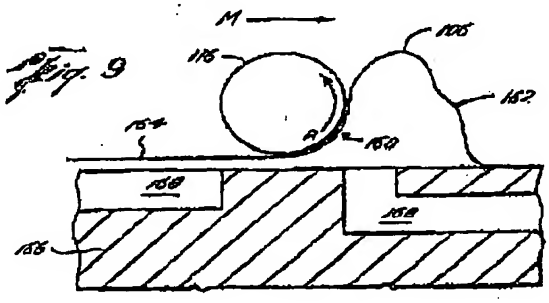

Fig. 9

US 5,260,009 (Penn)

- Penn discloses a method and process for manufacture of three-dimensional objects involves dispensing a layer of liquid, insoluble material onto a platform at predetermined locations, which then hardens.
- A second media is then sprayed onto this layer to thereby encapsulate the hardened insoluble media. The uppermost surface of this encapsulant is planed, thus removing a portion of the encapsulant to expose the underlying insoluble material for new pattern deposition.
- After the resulting planing residue is removed, another layer of liquid, insoluble media of any color is dispensed onto the planed surface.

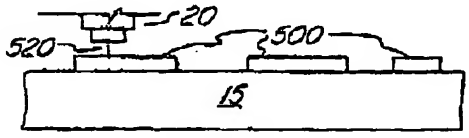

FIG. 8a

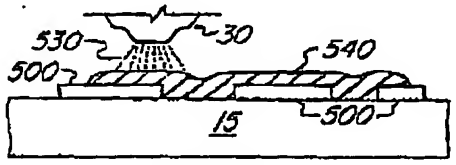

FIG. 8b

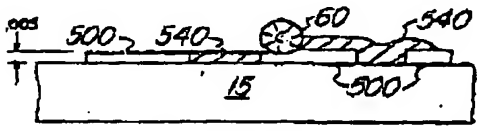

FIG. 8c